

CITY OF PHILADELPHIA
Department of Public Health
Public Health Services
Air Management Services

Statement of Basis

To: File
From: Edward Wiener, Chief of Source Registration
Date: 12/20/13
Subject: Modification of RACT Plan Approval and SIP in Conjunction with Plan Approval No. 12195 – Philadelphia Energy Solutions Refining and Marketing LLC (PES)

Company Information:

Philadelphia Energy Solutions Refining and Marketing LLC (PES) owns and operates a petroleum refinery at 3144 Passyunk Avenue, Philadelphia, PA 19145. The refinery was previously owned by Sunoco, Inc. (R&M).

Project Description:

PES has submitted Plan Approval Application No. 12195 which will modify the Reasonably Available Control Technology (RACT) plan approval issued to the facility on August 1, 2000 and the State Implementation Plan (SIP):

- Unit 231 B101 Heater (rated capacity 104.5 MMBTU/hr)
- Unit 865 11H1 Heater (rated capacity 87.3 MMBTU/hr)
- Unit 865 11H2 Heater (rated capacity 64.2 MMBTU/hr)
- Unit 210 H101 Heater (rated capacity 192.0 MMBTU/hr)
- Unit 210 H201A/B Heater (rated capacity 254.0 MMBTU/hr)
- Unit 866 12H1 Heater (rated capacity 61.2 MMBTU/hr)
- Unit 868 8H101 Heater (rated capacity 60.0 MMBTU/hr)

The application proposes replacing the MMBTU per hour heat input limit with a MMBTU per rolling 365-day period heat input limit for each heater. The application includes the installation of ultra-low NOx burners (ULNB) on the Unit 231 B101 Heater and the Unit 865 11H1 Heater.

The increases do not require any physical modifications to the heaters. The MMBTU/hr heat input limits originally came from the Reasonably Available Control Technology (RACT) plan approval issued to the facility on August 1, 2000. The rolling 365-day limits were used in the case-by-case RACT evaluations in Attachment A of the September 2013 application. Each heater burns refinery fuel gas.

Case-by-Case RACT

Section 182(b)(2) and (f) of the CAA requires that moderate (or worse) ozone nonattainment areas implement reasonably available control technology (RACT) controls on all major sources of VOC and NO_x. RACT has been defined as the lowest emission limit that a particular source is capable of meeting by the application of the control technology that is reasonably available considering technological and economic feasibility. EPA requires that states meet the CAA RACT requirements for the 1997 8-hour ozone national ambient air quality standard (NAAQS), either through a certification that previously adopted RACT controls in their SIP approved by EPA under the 1-hour ozone NAAQS continue to represent adequate RACT control levels for 8-hour ozone NAAQS attainment purposes, or through the adoption of new or more stringent requirements that represent RACT control levels.

Philadelphia County was designated under the 1-hour ozone NAAQS as part of the Philadelphia-Wilmington-Trenton severe ozone nonattainment area and under the 1997 8-hour ozone NAAQS as part of the Philadelphia-Wilmington-Atlantic City moderate ozone nonattainment area. *See* 56 FR 56694, at 56822 (November 6, 1991) and 69 FR 23858, at 23931 (April 30, 2004). PES (formerly Sunoco) has facility-wide potential emissions of over 100 tons per year for NO_x and over 50 tons per year for VOC, making it as a major source of both pollutants. AMS submitted a case-by-case RACT determination for PES for the 1-hour ozone NAAQS, and EPA approved this RACT determination into the Pennsylvania SIP on October 31, 2001. *See* 66 FR 54942. The 1-hour ozone RACT determination included NO_x controls for various emissions sources in the refinery that were not subject to other RACT regulations in the Pennsylvania SIP, as required under Pa. Code 129.91 – 92.

Since PES has requested to modify heat input limits and NO_x emissions rates for 7 heaters previously included in SIP-approved 1-hour RACT determination, AMS is hereby providing an updated RACT determination for NO_x controls on these heaters. AMS is requesting EPA to approve these changes to the previously approved RACT determination as a revision to the Pennsylvania SIP in order to meet the CAA RACT requirements for PES (formerly Sunoco) under the 1997-8-hour ozone NAAQS. The new RACT determination will result in the adoption of more stringent NO_x controls and emissions rates than the ones currently approved in the SIP as RACT for the 1-hour ozone NAAQS. Thus, this SIP revision will not interfere with any applicable requirement concerning attainment of the 1997 8-hour ozone standard in Philadelphia County or reasonable further progress or any other applicable requirement of the CAA.

Case-by-Case RACT Analysis for NO_x

Attachment A of the September 2013 plan approval application includes a full case-by-case RACT analysis for the heaters. AMS accepted this analysis, which is being incorporated by reference.

The following control options are available, including estimated NO_x reduction:

- Ultra Low NO_x Burners (ULNBs) and Selective Catalytic Reduction (SCR) – 96%
- SCR – 85%
- ULNBs – 66-76%
- Low NO_x Burners (LNBs) and Selective Non-Catalytic Reduction (SNCR) – 70%
- LNBs and Flue Gas Recirculation (FGR) – 55%
- SNCR – 40%

SCR was determined technologically infeasible for the 865 Heater 11H1 and the 210 Heater H201 because it would not physically fit the plot space and there is not adequate pressure to overcome the SCR pressure drop. FGR was determined technologically infeasible for the 865 Heater 11H1 and the Unit 210 Heater H201 because it would require the installation of mechanical draft burners, a major re-design of the units. FGR was determined technologically infeasible for the Unit 210 Heater H101 because it would not physically fit the plot space.

The table below summarizes the cost per ton of NO_x controlled for each control option. Since the Unit 210 H201A/B Heater already has ULNBs and the Unit 231 B101 Heater and the Unit 865 11H1 Heater are proposed to have ULNBs installed, only control options that are more efficient than ULNBs were evaluated for these heaters. For these heaters, SCR and SNCR were evaluated based on the units having ULNBs in place (NO_x reductions achieved adding SCR or SNCR to a heater already achieving a 0.03 lbs NO_x/MMBTU emission rate).

Source	Control Device Options (\$ per ton NO _x controlled)					
	ULNB & SCR	LNB & SNCR	SCR	ULNB	SNCR	
210 Heater H101	30,796	57,667	27,397	9,477	10,825	Tech. infeasible
210 Heater H201A/B	Has ULNB, SCR Tech. infeasible	162,271	Tech. infeasible	Installed	28,098 (after ULNB)	Tech. infeasible
865 Heater 11H1	Installing ULNB, SCR Tech. infeasible	Less effective than ULNB	Tech. infeasible	Installing	42,874 (after ULNB)	Tech. infeasible/Less effective than ULNB
865 Heater 11H2	34,287	11,045	32,909	6,737	13,132	8,704

866 12H1 Heater	34,831	11,331	33,524	6,737	13,379	8,960
868 8H101 Heater	35,060	14,513	33,782	6,737	13,482	12,965
231 Heater B101	Installing ULNB	Less effective than ULNB	102,243 (after ULNB)	Installing	39,924 (after ULNB)	Less effective than ULNB

While some of these heaters were able to burn fuel oil in the original RACT plan approval, this is no longer allowed. Each heater can only burn refinery fuel gas.

Under the new capacities and control efficiencies, AMS has determined adding new NO_x control technologies would be either technologically infeasible or economically unreasonable for the heaters. The existing ULNBs were determined RACT for the 210 Heater H201. The installation of ULNBs was determined RACT for the 231 Heater B101 and the 865 Heater 11H1. Combustion tuning was determined RACT for the other heaters.

AMS had determined RACT to be the following:

- Unit 231 B101 Heater – Installation of ULNBs
- Unit 865 11H1 Heater – Installation of ULNBs
- Unit 865 11H2 Heater – Combustion Tuning
- Unit 210 H101 Heater – Combustion Tuning
- Unit 210 H201A/B Heater – Existing ULNBs
- Unit 866 12H1 Heater – Combustion Tuning
- Unit 868 8H101 Heater – Combustion Tuning

Additionally, the lbs/MMBTU NO_x emission rates and MMBTU/rolling 365-day period heat input levels used in the case-by-case RACT analysis will become RACT limits for the heaters. The analysis was based solely on the burning of refinery fuel gas, so the ability to burn fuel oil will be removed.

Initial performance tests are required to determine compliance with the lbs/MMBTU NO_x emission limits for all heaters except for the Unit 210 Heater H201A/B, which is required to have a NO_x Continuous Emissions Monitoring System (CEMS).

The tables below show the effect of the proposed changes on potential NO_x emissions for each heater in both pounds per hour and tons per year.

	Current RACT Firing Limit (MMBTU/hr) ¹	Existing Annual Firing Limit (MMBTU/yr) ²	Current RACT NOx Emission Limit (lbs/MMBTU) ³	Current RACT Hourly NOx PTE (lbs/hr) ⁴	Current RACT Annual NOx PTE (tons/yr) ⁵
231 B101 Heater	91.0	797160	0.122	11.10	48.63
865 11H1 Heater	72.2	632472	0.4	28.88	126.49
865 11H2 Heater	49.9	437124	0.4	19.96	87.42
210 H101 Heater	183.0	1603080	0.4	73.20	320.62
210 H201 Heater	242.0	2119920	0.4	96.80	423.98
866 12H1 Heater	43.0	376680	0.4	17.20	75.34
868 8H101 Heater	47.9	419779	0.113	5.41	23.72
Total				252.56	1106.20

	Rated Capacity (MMBTU/hr) ⁶	Proposed RACT Annual Firing Limit (MMBTU/yr) ⁷	Proposed RACT NOx Emission Limit (lbs/MMBTU) ⁸	Proposed RACT Hourly NOx PTE (lbs/hr) ⁹	Proposed RACT Annual NOx PTE (tons/yr) ¹⁰
231 B101 Heater	104.5	915420	0.03	3.14	13.73
865 11H1 Heater	87.3	764748	0.03	2.62	11.47
865 11H2 Heater	64.2	562392	0.113	7.25	31.78
210 H101 Heater	192.0	1681920	0.089	17.09	74.85
210 H201 Heater	254.0	2225040	0.03	7.62	33.38
866 12H1 Heater	61.2	536112	0.113	6.92	30.29
868 8H101 Heater	60.0	525600	0.113	6.78	29.70
Total				51.41	225.19
Net Change				-201.14	-881.01

Footnotes in Tables:

¹Limit in current RACT Plan Approval.

²Operation at current RACT hourly heat input limit for 8,760 hrs/yr.

³Limit in current RACT Plan Approval. Assumes the worst-case fuel allowed in the current RACT Plan Approval. For heaters without a lbs NOx/MMBTU limit in the current RACT Plan Approval, 0.4 lbs NOx/MMBTU was used if they can burn oil in the current RACT Plan Approval (865 11H2 and 866 12H1 Heaters), 0.113 lbs NOx/MMBTU was used if they can only burn gas (868 8H101 Heater).

⁴Current RACT Firing Limit multiplied by Current RACT NOx Emission Limit

⁵Proposed RACT Annual Firing Limit multiplied by Current RACT NOx Emission Limit

⁶Physical rated capacity, not a permit limit.

⁷Operation at Rated Capacity for 8,760 hrs/yr. These annual firing rates were used in the case-by-case RACT economic analysis for the different control device options.

⁸Proposed limits for refinery fuel gas burning. Some limits are modifications to existing limits or new limits for heaters that do not have them in the existing RACT Plan Approval. The proposed revisions to the RACT Plan Approval do not allow oil burning for any of these heaters.

⁹Rated Capacity multiplied by Proposed RACT NOx Emission Limit

¹⁰Proposed RACT Annual Firing Limit multiplied by Proposed RACT NOx Emission Limit

The proposed changes will result in an overall reduction in the allowable NOx emissions from these heaters both on an hourly basis and a potential basis. As a result, they are not a relaxation of the current RACT limits (actually more stringent).

RACT/SIP Modifications

The following heat input limits are being removed from Sections 1.A and 2.C of the RACT Plan Approval:

- Unit 231 B101 Heater (91 MMBTU/hr)
- Unit 865 11H1 Heater (72.2 MMBTU/hr)
- Unit 865 11H2 Heater (49.9 MMBTU/hr)
- Unit 210 H101 Heater (183 MMBTU/hr)
- Unit 210 H201A/B Heater (242 MMBTU/hr)
- Unit 866 12H1 Heater from (43 MMBTU/hr)
- Unit 868 8H101 Heater from (49.5 MMBTU/hr)

The following rolling 365-day heat input limits are being added to Section 4.H as a replacement:

- Unit 231 B101 Heater shall not exceed 915,420 MMBTU on a rolling 365-day basis.
- Unit 865 11H1 Heater shall not exceed 764,748 MMBTU on a rolling 365-day basis.
- Unit 865 11H2 Heater shall not exceed 562,392 MMBTU on a rolling 365-day basis.
- Unit 210 H101 Heater shall not exceed 1,681,920 MMBTU on a rolling 365-day basis.
- Unit 210 H201A/B Heater shall not exceed 2,225,040 MMBTU on a rolling 365-day basis.
- Unit 866 12H1 Heater shall not exceed 536,112 MMBTU on a rolling 365-day basis.
- Unit 868 8H101 Heater shall not exceed 525,600 MMBTU on a rolling 365-day basis.

Note: These rolling 365-day heat input limits are less stringent than the limits in Plan Approval No. 12195, which are based on the projected actual emissions calculations used in that application.

The following Nitrogen Oxides (NO_x) emission limits for gas burning are being added or modified in Section 4.B and 4.C:

- 0.03 lbs/MMBTU for Unit 231 B101 Heater
- 0.03 lbs/MMBTU for Unit 865 11H1 Heater
- 0.113 lbs/MMBTU for Unit 865 11H2 Heater
- 0.03 lbs/MMBTU for Unit 210 H201A/B
- 0.113 lbs/MMBTU for Unit 866 12H1 Heater
- 0.113 lbs/MMBTU for Unit 868 8H101 Heater

Note: 0.089 lbs/MMBTU remains the limit for Unit 210 H101 Heater

The ability to burn refinery fuel oil is being removed from Section 1.A of the RACT Plan Approval for the following heaters (the other heaters did not have the capability in the RACT plan approval):

- Unit 865 11H1 Heater
- Unit 865 11H2 Heater
- Unit 210 H101 Heater
- Unit 210 H201A/B Heater
- Unit 866 12H1 Heater

Emission limits of 0.4 lbs NO_x/MMBTU are being removed from Section 4.C of the RACT Plan Approval for the following heaters:

- Unit 210 H101 Heater
- Unit 210 H201A/B Heater

The installation of ULNBs on 210 H201A/B Heater has been added as an existing RACT control in Section 4.B. ULNBs were added to this heater as part of a past plan approval.

The installation of ULNBs on 231 B101 Heater and 865 11H1 Heater within 18 months of the amendment of this plan approval is being added as a RACT requirement in Section 4.B. The heaters must comply with their existing MMBTU/hr heat input limits until the ULNBs are installed. The heaters do not need to comply with their new 0.03 lbs/MMBTU NO_x emission limits until after the ULNBs have been installed.